**Mechanisms of activation in technology of zinc sulfides silicate and materials on their basis**

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***Keywords****: sulfur activation mechanisms, zinc chloride, zinc silicate sulphide, quantum chemical calculations.*

A method has been developed for synthesizing inorganic zinc silicate sulphide, which consists in activation of the opening of the sulfuric ring by zinc chloride, which reduces the activation energy of the process, and at the same time, facilitates the chemical interaction of sulfur with surface silicon silicate. A comparative evaluation of the mechanisms of the disclosure of Cycloser molecules in the presence of zinc chloride and in its absence is given. The thermodynamic characteristics of various mechanisms of the attachment of diatomic sulfur to the surface of silicate have been calculated. The addition of sulfur to the atom of zinc fixed on the surface of silicate occurs with the lowest energy consumption. Developed on the basis of inorganic sulphide zinc silicate, sulfur materials have high physical-mechanical and operational properties. Optimal conditions of the synthesis process are determined.

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**The use of a polymeric modifier to improve the quality of gypsum binder**

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***Keywords:*** *gypsum binders, organosilicon modifier, water consumption, physical and mechanical properties.*

In the article rational ways of improvement and increase of technological and operational properties of building gypsum are considered. Increase the strength, change the setting and hardening of gypsum by introducing modifying additives. The article deals with the application of composite gypsum binders, to improve the structure and properties of which the capabilities of the organosilicon modifier are used. The use of a silicon-organic modifier opens up wider possibilities in regulating the setting process of binders and creating optimal conditions for the formation of products. The technical result is the possibility of obtaining building materials with predictable properties in a wide range that improve the consumer properties of gypsum binders.

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**Efficiency of reusing of pyroxyline gunpowders as the component of industrial explosives**

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***Keyword:*** *ammunition utilization, single base propellants, industrial explosives, slurry explosives.*

The article considers the possibility of using single base propellants, including recovered from ammunition disposal, as energy-intensive components of slurry explosive compositions for industrial use. The results of experimental studies of detonation characteristics and safety parameters of those explosive compositions in comparison with TNT and standard industrial explosives are presented. The efficiency of drilling and blasting operations by gunpowder water-gel compositions was compared with the standard industrial explosive composition Ammonite №6ZhV. Based on the conducted studies, conclusion about the potential of the use of gunpowder water-gel compositions for drilling and blasting operations was made.

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**Design of high pressure apparatus for supercritical processes**

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***Keywords:*** *supercritical fluid, supercritical process, high pressure apparatus.*

Conducting processes under supercritical conditions requires appropriate high-pressure apparatus. This paper is focused on development stages of high pressure apparatus for supercritical processes. High-pressure apparatus' working part design was developed on the basis of the results of supercritical carbon dioxide hydrodynamics mathematical modeling. To do this, modern computer simulation methods, based on principles of computational fluid dynamics (CFD), were used. Detailed engineering and strength calculations were carried out for the developed basic design. The designed apparatus was manufactured and successfully commissioned.

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**Heavy metals containing wastewater purification by nanofiltration and ion exchange methods**

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***Keywords:*** *membrane separation, nanofiltration, ion exchange, exchange capacity, heavy metals.*

Many useful and effective methods of wastewater treatment and water purification technologies are chemical, physicochemical, electrochemical and etc. The technologies of nanofiltration and ion exchange are widely used for the purification of wastewater, containing heavy metals, to decrease the environmental and ecological risks. Nanofiltration and ion exchange characteristics of wastewater purification from heavy metals have been studied. The influence of basic process parameters – temperature, pressure, concentration and pH value of the feed solution on flux and rejection of nanofiltration membranes has been considered. The ion exchange capacities of resins in the removal of heavy metal ions from wastewater have been determined.

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**The use of coagulants based on titanium and silicon chlorides in the purification of the filtrate of the solid municipal waste landfill**

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***Keywords****: filtrate of TKO polygon, coagulation, titanium and silicon chlorides.*

The issue of cleaning the filtrate of solid municipal waste landfills is a complex and urgent task. Today, the most effective technology for the purification of filtrate is membrane systems, but for their successful operation, the wastewater must undergo a pre-treatment stage. A promising direction of reagent processing is the use of titanium and silicon compounds as coagulants. In the course of the work, an assessment was made of the possibility of using coagulants based those elements compounds in the purification processes of the filtrate of solid municipal waste landfills. It has been established that titanium chlorides are significantly superior in purification efficiency to the most common coagulants (aluminum sulphate and ferric chloride).

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**The development of computer models of industrial technological scheme of the process thermo-oxidative destruction of the sludge**

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The computer model of the technological scheme of the process of oxidative destruction of the tar has been developed and realized. Is proposed to simulate the process of thermo-oxidative cracking in the reactor by using model components. Researched various options for technological design of the technological mode of the distillation of this production. Computer models of three different technological lines of distillation were created and realized. Is concluded that the technological scheme of distillation with the complex column have the lowest heat duty. The most energy-saving technological scheme of the distillation of the mixture of products of oxidative destruction of tar is chosen that is actual for resolve problems of the energy saving in the petrochemical industry.

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**Innovative Development Concept of Perspective Plant Protection Means in the Russian Federation ©**

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***Keywords****: variation synthesis, pesticide, plant protection product, PPP, matrix structure, new active substance, innovation, project.*

The article is conceptual. It is a way to introduce a new approach to plant protection products (PPP) in Russian Federation – Variation Synthesis of Natural Derived Matrix Structures©.

Concept implementation is able to unite efforts of scientists and specialists of Russian Academy of Sciences, Higher School and applied institutes to accelerate scientific search and industrial release of fundamentally new domestic active substances with higher efficiency, environmentally positive and accessible, to enforce sovereignty of economy. It provides a brief analysis of domestic PPP active substances production in Russia.

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